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MAJOR FRANK B. ROGERS, MC

Historical Division

Frank B. Rogers

Vol. II No. 5

Chief Malariologist, Hq USAFFE, APO 501

25 April 1945

Major Jesurun Writes:

"I would like to write a letter to each one of the officers and men of the Malaria Survey and Control Units whom I had the privilege of working with while in New Guinea, but time and especially the great paper shortage prevent me from doing it. As you know, I am not accustomed to making speeches but I feel that I want to thank you who worked with me in the control of malaria, I want to thank you for your unending cooperation and zeal in the performance of your duty. I have been awarded the Bronze Star Medal but I feel that a great part of that honor belongs to you without whose help nothing would have been accomplished. Thanks again, and good luck to you all."

Sincerely,

s/ Harold M. Jesurun
Major, MC

Major Jesurun is now taking a course at the Civilian Affairs Training School at Yale University. After six months of schooling and training, it is overseas again.

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Anopheles of Area Southwest of Subic Bay

Reported by

4th Malaria Survey Unit

The locality covered is that along Subic Bay southwest of Subic from Calapacuan to Matainhulo. The largest stream in the area is the Matagan River. The streams surveyed were found to be tidal from a half-mile to a mile above their mouths. Above this point they flow rather swiftly over rocks, leaving occasional still pools and backwaters which are shaded by tall trees and shrubs. Rocks and debris along the banks formed quiet pools in which mosquitoes were found breeding.

The mosquitoes breeding here were identified as:

Anopheles minimus flavirostris

Anopheles mangyanus

Anopheles litoralis

Anopheles barbirostris

Anopheles pseudobarbirostris

Anopheles insulaeflorum

Anopheles philippinensis

Anopheles ludlowii

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MOSQUITO LARVAE CONTROL IN STREAMS USING DDT EMULSION BY SINGLE POINT APPLICATION

by

The 31st Malaria Survey Unit
Lt. Wayne L. Howē, Sn C, Commanding

PURPOSE:

The rapid control of stream breeding Anophelines in the Philippine Islands during current military operations is of prime importance. It is believed that DDT insecticidal control can be used to accomplish this end, thus a series of studies are being carried out to determine the feasibility and effectiveness of the following types of preparations and applications.

1. DDT emulsion
2. DDT oil-drip barrel
3. DDT dust
4. DDT oil---plane sprayed
5. DDT oil---hand sprayed

Prior to the present war, the most effective means of controlling the stream breeding has been fluctuation of water levels by dams coupled with cleaning vegetation from the edges of the stream below the dam. This method of control is an excellent permanent measure but obviously cannot fulfill the requirements for immediate control when many miles of streams are involved.

DESCRIPTION OF STREAMS:

In the San Jose area on Mindoro, many small streams originate in and meander through the rolling hills and plains which lie between the main mountain range and the sea. Most have eroded deeply into the soil, thus the banks are steep. Shrubbery, trees and tall grass grow densely along the margins of most streams rendering the approach to banks difficult. Stream beds are undulating, consequently large slowly moving pools are found at frequent intervals.

Two large streams are found in the region. Their character is entirely different however, originating in the mountains, they follow through large wide rocky beds to the sea. They are easily accessible for larvicidal control.

MOSQUITO SPECIES:

Anopheles minimus flavirostris breeds abundantly in the small type of stream mentioned above, indicating the preference of the species for shaded water. It is found in both the rapidly and slowly moving portions of the streams. Anopheles barbirostris, a comparatively unimportant malaria vector is found second in abundance.

TECHNIQUE:

Larval Collections Stations:

Each station was established to include 6 ft. to 15 ft. of stream margin where larval counts were high. All larvae dipped were carefully counted and returned to the stream margin. To simplify tabulation of data, pupae were counted as larvae.

Larvicide:

Since emulsion has its greatest value where total larval elimination is desired, it was chosen first in preference to other preparations. Permeating through every section of the water it is lethal to all larvae present in sufficient concentration. The emulsion used was that devised by Captain William D. Bryan, SnC, of the 14th Malaria Control Unit.

Formula:

- (1) 1 pound of DDT powder plus 2 gals diesel oil # 2.
- (2) 1 $\frac{1}{4}$ pounds of GI soap plus 2 quarts of water.

The oil solution is added slowly to the soap solution with constant stirring. The milky emulsion is surprisingly stable and no difficulty with oil separation was experienced.

Apparatus:

An open sluice, 8 ft. long and 1 ft. wide with sides 5 inches high was used to divert the stream flow into a box 2 ft. by 3 ft. The box fitted with 3 baffles assisted in the complete mixing of the emulsion with the stream. The emulsion was introduced into the open sluice.

SECRET

Concentrations of Emulsion:

- (a) Original concentrate (see formula below)
Concentration 1/20.
- (b) 1st dilution (as applied to stream)
90 quarts of water added to 10 quarts 1/20 DDT
provides 100 quarts 1/200 DDT. (This step may not be necessary
but was used to obtain experimental accuracy in rate of
application)
- (c) Final dilution after entry into stream flow.
Stream flow averaged 30 cu. ft. per minute, thus con-
centration in stream flow at point of introduction was
18.5 PPM.

Dilution Formula:

The following dilution formula was used in above calculations:

$$D = \frac{AB}{A + C}$$

(Unit of volume used was pints therefore all volumes were calculated in pints. Concentration may be expressed in either fractional or decimal form.)

RESULTS:

The results are indicated in the charts below:

CHART I

Conc. Added	Vol qts	Dosage	Period	Ave Rate Flow	Conc. in Flow	Amt DDT	Distance Control	%Control
1/200	500	200 qts/hr	2½ hrs	30 cu ft per min.	18.5 PPM	5#	4652 ft or .88 mi.	99 +

Estimated average width of stream-----5 ft.

Estimated average depth of stream-----1 ft.

Total cubic ft. water controlled-----23,260 cu. ft. (estimated)

CHART II

Station Number	Distance Downstream ft.	AVERAGE NO. LARVAE PER DIP									
		Before Control	After control No. days								
		(1 day)	2	6	12	15	19	22	27	32	37
1	204	2.7	0	0	0	0	0	0	0	0	
2	396	7.2	0	0	0	0	0	0	0	0	
3	606	3.0	0	0	0	0	0	0	0	0	
4	792	7.2	0	0	0	0	0	0	0	0	
5	982	4.0	0	0	0	0	0	0	0	0	
6	1188	2.4	0	0	0	0	0	0	0	0	
7	1419	4.7	0	0	0	0	0	0	0	0	
8	1619	5.8	0	0	0	0	0	0	0	0	
9	1859	9.8	0	0	0	0	0	0	0	0	
10	2180	5.8	0	0	0	0	0	0	0	0	
11	2280	7.2	0	0	0	0	0	0	0	0	
12	2531	4.4	0	0	0	0	0	0	0	0	
13	2764	4.8	0	0	0	0	0	0	0	0	
14	2544	8.5	.1	0	0	.3	.3	.6	.2	0	
15	4402	7.6	.1	0	.4	1.7	.7	1.6	2	5	
Total dips		109	212	107	95	105	120	100	90	105	
Total larvae		607*	3	0	4	22	15	16	13	75	
Ave no/dip		5.6	.01	0	.04	.4	.1	.2	.1	.7	
% reduction		---	99.8	100	99.3	99.3	97.1	97.1	97.6	87.5	

* 527 Anopheles (mostly minimus)
80 Culex sp.

* Egg rafts found. Next check yielded no larvae.

SECRET

NOTES:

1. Station 16, approximately 2000 ft. below station 15, furnished data indicated little or no control. Data on all more distant stations is considered statistically insignificant and not tabulated.

2. 9 days after dosage was applied, a check was made to determine the actual extent of effective control by checking both up and downstream from sta. 15. This point was placed 250 ft. downstream from station 15.

3. Checks maintained on the same stream and nearby streams indicated no significant increases or decreases in larval populations.

4. Results indicate excellent control over the distances tabulated above for the periods indicated. Additional stream checking was carried out at points other than stations. Small necks of water extending back 2 and 3 ft. away from the stream contained no living larvae. Apparently a considerable residual remained in the large pools preventing reinfestation throughout the entire length studied at this date.

DISCUSSION:

Five pounds of DDT applied in emulsion form on standing water would control all larvae in 80,586 cu. ft. of water assuming 1 PPM as the lethal dosage. Since, in this experiment, complete control was effected in as estimated 23,260 cu. ft. of water, inefficiency in use of DDT is indicated. However, as the residual effect continues to persist, the efficiency obviously also increases.

The apparatus used is probably not necessary. Application of dosages directly into a swift portion of the stream would provide similar results. The apparatus was used to obtain accuracy in measurements.

It is probable that a series of introduction points along a greater length of stream would increase the efficiency of this method of control by the accumulative effect in the downstream portions of the stream, thus dosages could be decreased.

At this date the total period of residual effectiveness is not known. This will be tabulated when reinfestation is first apparent and reported in a future paper comparing emulsion with other forms applied.

The high concentration introduced killed a few fish, crayfish, water beetle and shrimp. This might afford an effective means for the control of the snails and cercariae of schistosomiasis.

CONCLUSION:

Where control of malaria vectors breeding in small streams is urgent and the expenditure of ingredients is considered justified, this method of control is entirely feasible.

Further studies with the other forms of application may prove to be more efficient. Dusting would have the advantage of adult control also for Anopheles minimus flavirostris found resting more often along the protected banks of streams.

It is suggested that the stream be tested first as hard water has a tendency to cause the mixture to curdle.

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MEDICAL REPORTS FROM JAVA

"The malaria rate has increased at least 50 percent along the western coast of Java, according to intelligence reports from the Office of Strategic Services SEAC, based on the interrogation of a group of six natives. This increase was attributed to the fact that the Japanese have completely disregarded the Dutch sanitary regulations and have taken no measures of malaria control whatsoever. All civilian supplies of atabrine and quinine have long since been requisitioned by the Japanese, and no drugs are available on the 'white' market."

"Plague is stated to have broken out in Batavia in May 1944 and reached epidemic proportions. Rows of buildings were burned to control the disease. The epidemic was said to have originated in Bandoeng."

The above quoted from South Pacific Newsletter No. 18, December 1944.

SECRET

Survey of Mosquito Breeding in the City of Manila.

by

26th Malaria Survey Unit

During the month of March, with the assistance of Filipino civilian personnel, the area in the city of Manila which lies South of the Tinejeros River, North of the Pasig river and west of Quezon Ave. and Dimasalang Street was surveyed for mosquitoes, and notes on general sanitation were made. This area is roughly 9,000 yards by 3,000 yards. The survey covered representative sections of the city. Only an occasional collection of Aedes aegypti was made. No Anopheles minimus were found. Culex fatigans was the dominant species taken and was found breeding in large numbers in almost all standing water. The following species were taken:

<u>Anopheles vagus limosus</u>	<u>C.fuscocephalus</u>
<u>A. hyrcanus lesteri</u>	<u>C. incognitus</u>
<u>A. litoralis</u>	<u>C. summorosus</u>
<u>Aedes aegypti</u>	<u>C. salinus</u>
<u>Culex fatigans</u>	<u>C. palmi</u>
<u>C. rubithoracis</u>	<u>Lutzia fuscans</u>

Blood Survey on Balara Filters Area Evacuees.

At the request of civilian authorities in charge of the Welfareville evacuee station, a survey was conducted to establish data concerning malaria incidence in persons previously residing in the Balara Filters area. A thick and thin smear was taken on each of 200 evacuees checked, and the specimens were stained and examined for malaria and filariasis.

Since the specimens were taken at a place different from the environment in which these civilians had been residing, nothing to date is known concerning the locality where these cases originated. Civilian authorities report that prior to Japanese occupation there were cases of malaria in the population indigenous to Balara but that through effective permanent control only sporadic cases occurred. It is further reported that neglect has rendered control installations non-operative and that malaria has been gradually increasing in the local population in the area.

Principal findings were as follows:

1. 48% of the persons checked reported having had malaria at some time during period of Japanese occupation.
2. 33% of the group reported one or more attacks of malaria since January 1st, 1945.
3. 12% of the evacuees stated that they now have active malaria.
4. 22% of the smears examined were positive for malaria plasmodia. Of the 44 positives, 5 were positive for the gametocytes of P. falciparum, and 39 positives for P. vivax were found.
5. In general the rate was appreciably higher in the age group above 16 years.
6. All slides were negative for filariasis.

HISTORY OF MALARIA IN BALARA EVACUEES BY SEX AND AGE GROUPS

		AGE GROUPS				
		0 - 5	6 - 10	11 - 15	16-20	over 20
MALE	Total Ex.	25	13	11	5	31
	No. Pos. Hist.	10	6	7	4	17
	% Pos. Hist.	40.	50.	63.	80.	55.
FEMALE	Total Ex.	27	17	16	11	44
	No. Pos. Hist.	9	6	9	5	23
	% Pos. Hist.	33.	35.	56.	45.	50.
TOTAL BY AGE GROUPS	Total Ex.	52	30	27	16	75
	No. Pos. Hist.	19	12	16	9	40
	% Pos. Hist.	36.	40.	59.	56.	53.

Intestinal Parasite Infections Among Restaurant Employees.

The work quoted below was done by 30th Malaria Survey Unit, Lt. Robert B. Burrows, Parasitologist, was in charge.

During the month (March) a survey was made of employees in civilian restaurants, cafes and lunch stands in Dagupan. During the past two months the unit has made examinations of 280 Filipinos living in the areas around Dagupan. The employees of restaurants comprised 84, leaving a total of 129 from the town and its immediate surroundings. In the following table is a comparison between the incidences of restaurant employees and non-employees:

	<u>Restaurant employees</u>	<u>Others</u>
Number examined	84	129
Negative	7.1%	13.1%
Endamoeba coli	21.4%	26.4%
Endamoeba histolytica	13.1%	6.2%
Endolimax	10.7%	10.1%
Iedamoeba	1.2%	
Chilomastix	2.4%	4.7%
Trichomonas		3.1%
Giardia	7.1%	11.6%
Balantidium		.8%
Hookworm	9.5%	11.6%
Ascaris	89.3%	76.7%
Trichuris	59.5%	58.6%
Strongyloides		.8%
Glonorchis	2.4%	
Heterophyes		.8%
Aver. no. species per person	2.17	2.12

This data shows that restaurant employees had a slightly higher average number of species per person, had a smaller percentage free of infections, had over twice the incidence of Endamoeba histolytica, and had about 12 percent higher Ascaris infections. Apparently the restaurant owners and employees are more careless than people in their homes, for those infections (pathogenic types) obtained through contaminated food and water are quite prevalent. Therefore, restaurant sanitation in Dagupan is practically non-existent.

The following table gives the variations found in the restaurants examined. Each restaurant is designated by a letter in this report, but in the daily report to the Provincial Director of Health the specific data of each restaurant were given.

<u>Restaurant</u>	<u>No. Employ.</u>	<u>Aver. No. Species per employee</u>	<u>Percent Negative</u>	<u>Remarks</u>
A	5	2.8	6.0	E.histolytica four
B	2	1.0	50.0	Clonorchis found
C	6	2.5	0.0	" "
D	2	2.5	0.0	
E	5	1.4	0.0	
F	5	1.6	0.0	
G	4	1.8	0.0	E.histolytica found
H	5	3.0	0.0	" " "
I	4	3.0	0.0	" " "
J	8	2.1	12.5	" " "
K	2	1.0	0.0	
L	4	2.5	0.0	E.histolytica found
M	3	3.3	0.0	
N	4	3.3	0.0	E.histolytica found
O	6	1.5	33.3	
P	1	2.0	0.0	
Q	9	1.8	22.2	
R	2	2.0	0.0	
S	2	1.5	0.0	
T	2	1.5	0.0	
U	3	1.5	0.0	

Ascaris infections were found in every restaurant, Trichuris infections in all but five, and non-pathogenic protozoan infections in all but three. Endamoeba histolytica infections were found in seven restaurants and in two of these (G and J) 50 per cent of the employees harbored this parasite. In only four restaurants were any employees found who were free of some infection. With respect to the average number of species per employee, four restaurants had three or more species, eight had between two and three and the remainder had from one to two species per person.

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CHIGGER AND RAT INVESTIGATIONS

The following article is taken from a report made by the 30th Malaria Survey Unit, under the command of Captain C. O. Mohr, Sn. C. This unit did much of the work at Sansapor, presence of scrub typhus in one of the islands of the Philippines gave point to some attention to its possibility in the area of Birmaley - Mangaldan, Luzon. Accordingly, examination of rats for chiggers was continued here, rats being the most efficient collectors of these parasites.

"Rats were caught in different habitats arranged below in a series from most heavily populated by chiggers (as indicated by the numbers in rats' ears) to least populated.

"a. Two areas densely covered with grass, ferns, a species of daisy and low bushes. Ground underneath noticeably moist but not damp. Nine rats caught, all infested, had a total of 400 chiggers in their ears. The average number of chiggers per rat was about 45. Note that it is about the same as the general average for concolor rats at Sansapor and that the total number from these rats is not much larger than the average for individual ringens rats at Sansapor. This indicates a relatively low abundance at this time of year in even the best of habitats.

"Such desirable chigger environments are extremely uncommon and small in this region, the combined areas not exceeding two acres.

"b. A dense 3 foot wide hedge of grass on characteristic low ridges used by Filipinos to bound individual rice paddies. Soil hard, dry and cracked. Five rats examined had an average of 30 chiggers. All were infested.

"c. Fencerows of shrubs and herbs bordering canefields and coconut grove which are pastured. Six rats had an average of six chiggers. All but one were infested.

"d. Prominent mounds of dirt dotting now severely dry rice paddies and covered thinly with bushes. Mounds are from several feet to about 8 feet high and said to have been constructed by ants. Only one of three rats had chiggers in its ears to a total of eight.

"These chiggers have been determined tentatively as Trombicula but have been forwarded for final determination to an expert in the group. The species of rat has not yet been determined but is neither Rattus concolor nor Microtus montebelli which are known scrub typhus reservoirs. It is a strawcolored species of Rattus, lighter in color and slightly smaller than the familiar barn rat of America. A species of shrew common here rarely bears chiggers."

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SCHISTOSOMIASIS

Tests and Experiments being
done by 5th Malaria Survey Unit

DRUG TESTS. A series of naturally infected dogs are being treated with fuadin in dosages approximating that used in humans. The dogs are being dissected at varying time intervals to observe the effects of the drug on the worms.

CHLORINATION TESTS. Studies are in progress to determine the amounts of chlorine or iodine disinfectants which should be added to water to kill all cercariae. Except for the tests with Bursoline, this work is virtually complete.

EXPERIMENTAL INFECTION OF ANIMALS. Before any extensive work with new drugs is undertaken it will be necessary to have animals on hand which are uniformly infected with schistosome worms. Animals have been exposed to infection in several different ways and they are now under observation.

Next month we hope to be able to give a more complete picture of these tests.

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SCHISTOSOMIASISSnail Collections and Schistosomiasis in the
Dagami-Burauen-Julita-Dulag Area of Leyte, P.I.

During February and March 1945 snail collections were made in watery areas adjacent to military installations along the roads connecting Dagami, Burauen, Julita and Dulag by the 32nd Malaria Survey Unit under the command of Captain K. V. Krombein. Parasitologists of the unit who did much of the work are Lt. Merle F. Hansen and Lt. Howard A. Bern.

Although primary interest was in snails of the genus Oncomelania (Schistosomophoras), the intermediate host of Schistosoma japonicum, the blood fluke of man, all snails found were brought in to the laboratory and were dissected for cercariae. Experience of other malaria survey units had indicated the possibility of another snail vector of human schistosomiasis, in addition to the known Philippine vector, Oncomelania (Schistosomophora) hydrobiopsis.

Due to the absolute unavailability of literature or keys, it was impossible identify the other genera of snails found and accordingly were lettered as "A", "B", etc, through "G".

Incidence of Schistosomiasis.

a. In addition to snail data, the incidences of schistosomiasis found in civilian populations are also recorded. These figures have been reported previously in separate letters and are summarized below:

	<u>No. Examined</u>	<u>Date reported</u>	<u>% Infected with Schistosoma</u>
Dagami	137	21 Feb 1945	23.0%
Burauen	329	12 Feb 1945	1.8%
* Julita	235	16 Jan 1945	1.3%
Rawis (Dulag)	63	5 Mar 1945	0.0%
San Jose (Dulag)	99	5 Mar 1945	10.0%

* Acquired outside Julita.

Snail collection data.

a. More than 1600 snails were dissected throughout the entire area examined, including at least 8 genera. At least 9 widely different varieties of cercariae were found.

b. In one genus of snails, a small laterally flattened non-operculate variety, resembling a coiled watchspring, two varieties of cercariae were found. One of these was fork-tailed, but the furcae were at least as long as the body of the tail, and have no resemblance to schistosome cercariae. It is assumed that this is a strygeid cercaria.

c. Two genera of snails (watchspring) carried 2 - 3 varieties of cercariae.

d. Snails of the genus Oncomelania were found near Dagami and along the Burauen-Dagami road in rice paddies (in Dagami, in which carabao were wallowing) and in grass-covered standing water channels. No Oncomelania were found in any of the stream banks surveyed.

That the Dagami area is undoubtedly among the worst on Leyte as regards schistosomiasis is indicated by:

- (1) The large number of Oncomelania snails in rice paddies in this area.
- (2) The presence of cercariae of S. japonicum in 2% of Oncomelania dissected.
- (3) The figure of 23% positive for schistosomiasis after only one examination of 137 school children at Dagami.
- (4) The occurrence of at least 37 cases of schistosomiasis in one battalion of an Infantry Regiment which had bivouacked for about one month in the Dagami-Kiling area.

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NEW T/O POSSIBILITIES

The following letter from Lt. Colonel O. R. McCoy, M.C., of the Surgeon General's Office, Washington, D.C. is quoted in part for the information of all.

"Dear Colonel Orth:

"For the past year and a half we have been attempting to obtain approval for a headquarters organization which could be used for malaria control and survey units. The recently revised TO/E 8-500 has finally included authorization to use medical battalion headquarters for this purpose.

"The headquarters consists of four officers and twelve enlisted men, with equipment and transportation to operate the clerical and supply services so necessary at the headquarters of a malaria control project. As written, the staff includes one Medical, Sanitary or Pharmacy Corps officer and three Medical Administration Corps officers, but footnotes on page 7 provide that the military occupational specialties may be altered to conform to the service administered by the battalion headquarters. This means that you can use any type of officer that will fit the need.

" It is our idea that if this headquarters organization were adopted, the present malariologists of base or advance sections, Air Forces or Ground Force units, could be converted to act as commanders of the malaria control battalion headquarters or could be assigned as officers within such an organization. Also, there might be opportunity to promote deserving officers now assigned to malaria units. The battalion commander would be responsible to the surgeon of the unit to which his battalion was assigned, and would be in overall command of some 3 to 6 malaria control and/or survey units."

This whole problem must be studied and recommendation presented to Hq USAFFE. Major Baldaun, M.C., is preparing such a study for the USAFFE Board. Further developments will be published.

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MALARIA RATE

The malaria rate in the theater is still rising. Very few rates are available this month, but of several that are available, only two show a slight reduction. Base B rose steeply the past month from 44/1000/annum in February to 98.5/1000/annum in March. Captain Joseph C. Sweeney, Base Malariologist, gives the following data for the rise at his base:

"Laxity of atabrine administration in some organizations. In a special report to the Base Commander by the undersigned on 16 March, it was pointed out that in a personal study of nineteen (19) USASOS units contributing malaria cases for the week ending 9 March, improper atabrine administration was definitely found in five (5) and deficiencies, or possible deficiencies, in four (4). These units had a total of twelve (12) malaria cases that week. Four (4) additional units, with seven (7) cases, did not permit of accurate evaluation of atabrine administration because they had instituted more rigid systems shortly beforehand. Thus it is evident that some degree of laxity in administering atabrine may well have accounted for 19 (59%) of the 32 cases of malaria that week. Similar instances were found in subsequent investigations throughout the month."

Although no rates for Luzon are available, the number of Malaria Case Report Cards submitted by medical installations suggest that the rate is fairly high. Also, a study made of 1000 of these cards showed that 34% of the patients admitted not taking atabrine regularly.

Once more it is suggested that large scale advertising be done as this seems to be the most effective way of impressing troops that there is still a danger from malaria. One example of such advertising is by the sign seen on the side boards of one unit's 6 x 6. It reads:

"You Brought Malaria With You From NG
T A K E Y O U R A T A B R I N E"

PARASITOLOGICAL

Results of 1532 Blood Smears.

A total of 1532 blood smears was examined for malaria during the month of March by the 425th Medical Composite Unit (MS), CO N. D. Levine, Capt., Sn. C. Of these, 1473 were taken on surveys in Tayug and San Quintin, Pangasinan; in San Jose and Lupao, Nueva Ecija; on refugees in San Jose from Carrangan, Nueva Ecija and Santa Fe, Nueva Vizcaya; and in the Dingalan Bay area in Bitulok Barrio, Lamon, Nueva Ecija, and in Dingalan Barrio, Baler, Tayabas. An additional 59 were read for the PCAU Civilian Hospital, Tayug. A summary of the results of the surveys are given in Table I.

TABLE I

RESULTS OF BLOOD EXAMINATIONS - Malaria Surveys - Summary - March, 1945

No. Exam.	Total		Pf		Pv		Pm		Mixed#		PSU	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Pangasinan												
Tayug	261	37 14	12 32		25 68							
San Quintin	267	13 5	2 15		11 85							
Nueva Ecija												
San Jose	186	20 11	6 30		13 65				1 5			
Lupao	77	3 4	1 33		2 67							
Carrangan *	131	19 15	5 26		14 74							
Bitulok **	386	122 32	36 29		79 65		1 1		6 5			
Tayabas												
Dingalan **	100	33 33	7 21		24 73		2 6					
Nueva Vizcaya												
Santa Fe *	65	18 28	3 17		11 61		4 22					
TOTAL	1473	265 18	72 28		179 68		7 3		7 3			

* Refugees at San Jose, Nueva Ecija.

** Dingalan Bay Area.

All mixed infections Pf - Pv.

In sum, 18% of the 1473 persons examined were positive for malaria. Of the 28% were Plasmodium falciparum infections, 68% P. vivax, 3% P. malariae, and 3% mixed P. falciparum and P. vivax infections. The incidence of malaria was highest in the 0 - 5 year age group (27%), as compared with 15% and 19%, respectively in the 6 - 15 year group and the adult group. These relationships are probably not valid, however, since the youngest and oldest age groups contained relatively larger numbers of persons from the heavily infected towns. There was no significant difference in malaria incidence between males and females. The incidences of malaria in the different towns varied from 4% at Lupao, Nueva Ecija to 33% at Dingalan Barrio, Baler, Tayabas. The percentage of infections due to Plasmodium falciparum varied from 15% at San Quintin, Pangasinan to 33% at Dingalan Barrio, Baler, Tayabas. The percentage of infections due to Plasmodium falciparum varied from 15% at San Quintin, Pangasinan to 33% at Lupao, Nueva Ecija, while that of P. vivax varied from 61% at Santa Fe, Nueva Vizcaya to 74% at Carrangan, Nueva Ecija. The incidence of P. malariae infections found among residents of Santa Fe was particularly high (22%) as compared with its incidence in the other towns. The percentage of P. falciparum infections was lowest (16%) in the 0 - 5 year age group, rising to 48% in the adult group. The percentage of P. vivax infections decreased reciprocally from 76% in the 0 - 5 age group to 50% in the adult group. There was no significant difference in species distribution between males and females.

Spleen Rates for Above Surveys

No. Exam.	Total		1 Plus		2 Plus		3 Plus		4 Plus	
	No.	%	No.	%	No.	%	No.	%	No.	%
Pangasinan										
Tayug	261	122 47	106 87		16 13					
San Quintin	267	159 60	128 81		31 19					

Spleen Rates (Cont'd)

No. Exam.	POSITIVE									
	Total		1 Plus		2 Plus		3 Plus		4 Plus	
	No.	%	No.	%	No.	%	No.	%	No.	%
Nueva Ecija										
San Jose	146	72	49	57	79	14	19	1	2	
Lupao	76	31	41	27	87	4	13			
Carranglan *	107	61	57	47	77	13	21	1	2	
Bitulok **	384	151	39	127	82	27	18			
Tayabas										
Dingalan **	99	67	67	52	78	13	19	2	3	
Nueva Vizeaya										
Santa Fe *	44	11	25	9	82	2	18			
TOTAL	1384	674	49	550	81	120	18	4	1	

* Refugees at San Jose, Nueva Ecija.

** Dingalan Bay area.

In sum, of the 1384 individuals examined, 49% had enlarged spleens, of which 1% were 1 plus, 18% 2 plus, and 1% 3 plus. The highest spleen rate, 67%, was found at Dingalan, and the lowest, 25%, among the refugees from Santa Fe.

RELATION OF SPLENOMEGALY TO PRESENCE OF PARASITES

	Total Exam.	Total Pos.		DEGREE OF SPLENOMEGALY							
		Spleens		1 Plus		2 Plus		3 Plus		4 Plus	
		No.	%	No.	%	No.	%	No.	%	No.	%
P. falciparum	70	44	63	29	66	15	34		1		
P. vivax	171	92	56	71	77	20	22	1	1		
P. malariae	7	6	86	5	83	1	17				
Mixed Pf - Pv	7	6	86	2	33	4	67				
Total Parasitized	255	148	58	107	72	40	27	1	1		
Total Negative	1129	526	47	443	84	80	15	3	1		
Total	1384	674	49	550	81	120	18	4	1		

The incidence of splenomegaly was higher among parasitized individuals (58%) than among those who were negative (47%), and in addition the degree of spleen enlargement in persons with splenomegaly was greater in the parasitized individuals.

RELATION OF PARASITE RATE TO SPLEEN RATE

	No. Exam.		Parasite Rate (%)	Spleen Rate (%)	Mean Splenic Index
	Blood	Spleen			
Tayug	261	261	14	47	1.1
San Quintin	267	146	5	60	1.2
San Jose	186	146	11	49	1.2
Lupao	77	76	4	41	1.1
Carranglan	131	107	15	57	1.2
Bitulok	386	384	32	39	1.2
Dingalan	100	99	33	67	1.3
Santa Fe	65	44	28	25	1.2
Total	1473	1384	18	49	1.2

It is seen that there is no constant relation between the parasite rate and the spleen rate.

RESULTS OF BLOOD EXAMINATIONS -- PCAU Civ. Hosp., Tayug

	No. Exam.	POSITIVE									
		Total		Pf		Pv		Pm		Mixed	
		No.	%	No.	%	No.	%	No.	%	No.	%
0 - 5 Yrs											
Males	4	2	50	1	50	1	50				
Females	4	0									
Total	8	2	25	1	50	1	50				
6 - 15 Yrs											
Males	8	2	25			2	100				
Females	3	1	33	1	100						
Total	11	3	27	1	33	2	67				

SECRET

BLOOD EXAMINATIONS -- PCAU Civ. Hosp., Tayug. (Cont'd)

		POSITIVE											
		Total		Pf		Pv		Pm		Mixed		PSU	
No.	Exam.	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Over 15 Yrs													
Male	12	5	42			5	100						
Female	28	6	21	1	17	5	83						
Total	40	11	28	1	9	10	91						
Total													
Male	24	9	38	1	11	8	89						
Female	35	7	20	2	29	5	71						
GRAND TOTAL													
	59	16	27	3	19	13	81						

In sum, 27% of the 59 sick individuals were positive for malaria of which 9% were P. falciparum and 81% P. vivax.

GAMETOCYTE RATES - MARCH 1945

	P. falciparum			P. vivax			P. malariae		
	No.	Pos.	% w. Gam.	No.	Pos.	% w. Gam.	No.	Pos.	% w.
Tayug	12		75	25		12			
San Quintin	2		100	11		0			
San Jose	7		57	14		29			
Apao	1		100	2		0			
Barangilan	5		60	14		29			
Bitulok	42		76	85		12	1		100
Dingalan	7		86	24		4	2		100
Santa Fe	3		100	11		0	4		75
CAU Hosp, Tayug	3		0	13		23			
TOTAL	82		73	199		13	7		86

The figures in the above table include the mixed infections.

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DDT Control Experiments

Major Curtis Beerman reports an interesting experiment being tried at Base G.

"Several controlled and several non-controlled experiments have been made and are being carried out to determine the effectiveness of spraying 5% DDT-diesel solution onto the foliage and ground over a 100 foot band of wooded area about certain camps. In the areas so sprayed the Aedes breeding was occurring in the wooded area in tin cans or tree holes. It was hoped by this method to kill the infected mosquitoes resting at the time of the spraying and at the same time to produce a 100 foot barrier which would kill any A. scutellaris that would attempt to migrate thru this zone. Experiments carried out in Florida indicates that this type of treatment has in other areas and against other species of mosquitoes produced a residual barrier for a period of more than 17 days."

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ATTENTION

MALARIA SURVEY UNITS

This office has on hand a number of copies of "A Synopsis of the Philippine Mosquitoes" by Richard M. Bohart, Lieutenant (jg), H (S), USNR, U. S. NAVAL MEDICAL RESEARCH UNIT # 2.

A copy will be sent upon request to those units so desiring a copy of this work.

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